



	<b>Experiment title:</b> <b>Crystal hydrates of rigid rod polymers for high tenacity yarns from eco-friendly superfluids</b>	<b>Experiment number:</b> MA33
<b>Beamline:</b> ID11	<b>Date of experiment:</b> from: 29 <sup>th</sup> June 2006 to: 01 <sup>st</sup> July 2006	<b>Date of report:</b> 30 <sup>th</sup> August 2006  <i>Received at ESRF:</i>
<b>Shifts:</b> Nine	<b>Local contact(s):</b> Caroline CURFS	

**Names and affiliations of applicants (\* indicates experimentalists):**

**Guido Heunen (\*)**

**Ann Terry (\*)**

**Jules Harings (\*)**

**Sanjay Rastogi (\*)**

**Report:**

Liquid crystalline polymer solutions are excellent precursors for manufacturing high modulus and high tenacity yarns. Most of the polymers used for the preparation of these strong fibres comprise aromatic units in the backbone, eg. Poly(para-phenylene terephthalamide) also known as (PpPTA). In the spinning process use is made of the local orientation, which is already exhibited by the liquid crystalline solutions. Local orientation is transformed into macroscopic orientation by applying an elongational flow field, which eventually results in highly oriented fibres without the necessity of a post treatment. Although these kinds of polymers have high thermal stability and do not exhibit softening behaviour before degradation, processing cannot be done in the molten state. Production of PpPTA fibres is done by the dissolution of the polymer in concentrated sulphuric acid. Here we show some modifications in the structure of PpPTA in presence of superheated water.

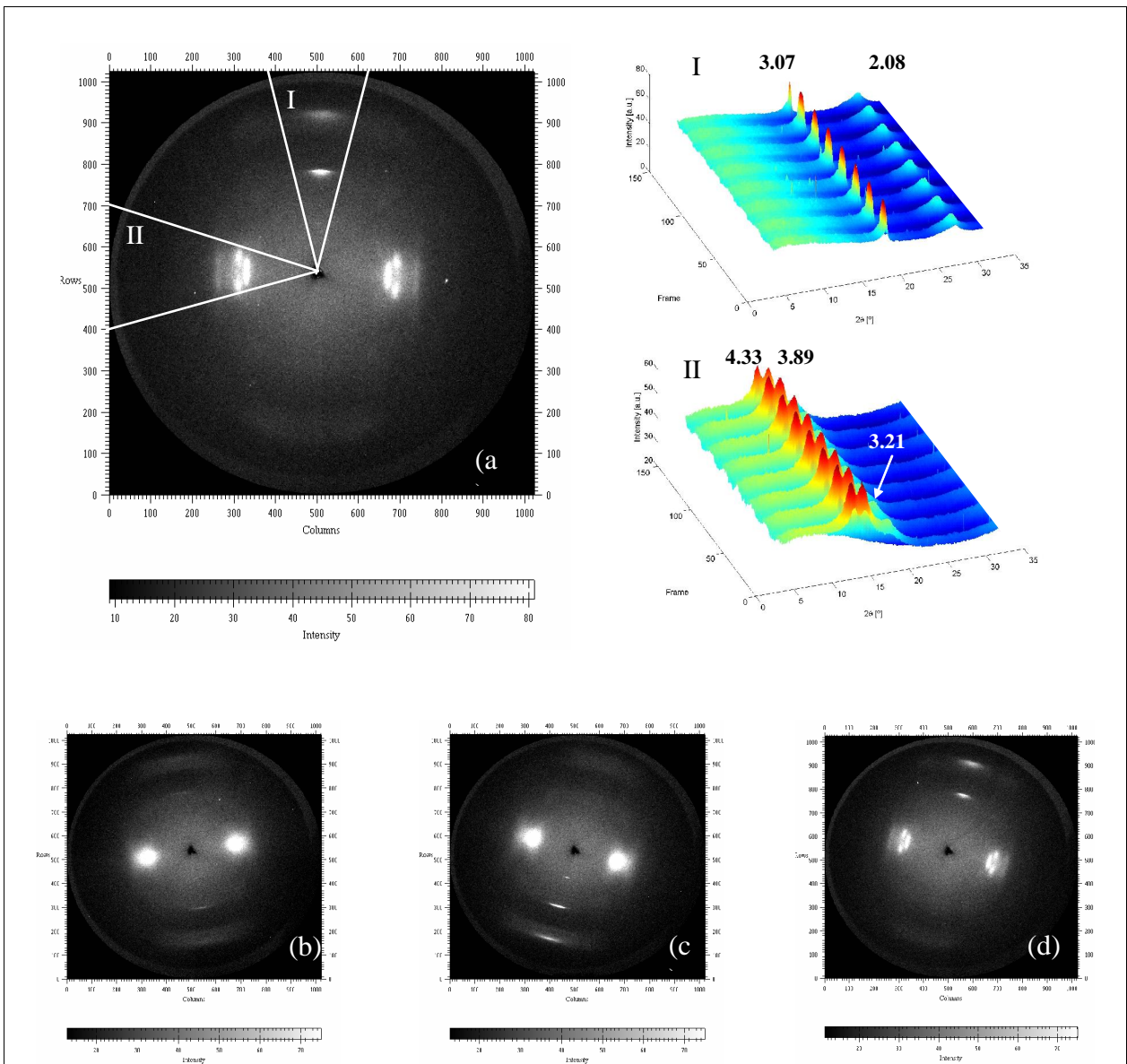


Figure Cross sectional wide angle x-ray diffraction patterns of drawn fibres; (a) exposed to  $\text{CO}_2$  pressurized superwater at  $220^\circ\text{C}$  for 24 hours; (b) as received; (c) annealed at  $220^\circ\text{C}$  for 4 hours; and exposed to super heated water at  $220^\circ\text{C}$  for 24 hours (d-spacings in  $\text{\AA}$ )